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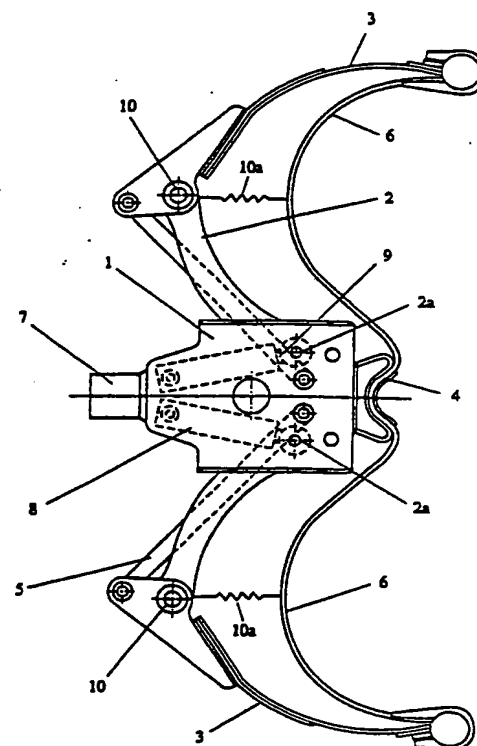
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(54) Title: REFUSE BIN GRABBING APPARATUS

(57) Abstract

There is disclosed a refuse bin grabbing apparatus for grabbing a bin for movement to an elevated unloading position for emptying into a refuse truck including a power-driven linkage (5) for moving a bin-grasping clamp (2, 3) towards inter-engagement with a refuse bin, the grasping clamp including articulated clamping arms (3) for embracing a refuse bin, the arms being fitted with a flexible belt (6) located between the clamping arms and a bin to be clamped so that the belt is tensioned in the bin-engaging position; the articulated clamping arms are retractable to an out-of-the-way position to ensure that the clamping arms (3) do not protrude from the outer confines of the vehicle in the rest position.



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REFUSE BIN GRABBING APPARATUS

The present invention relates to a refuse bin grabbing apparatus, particularly a so-called side lift system. Systems of this type are described in our earlier patent application No. 60231/90 first filed 8th August, 1989.

5 A major advantage of this system is the possibility of single man operation of the motor vehicle, loading of the contents of a refuse bin and restoring the refuse bin to its original position without the operator leaving his driving position.

Other prior art known to the Applicant includes Australian Petty Patent No. 629165 disclosing hydraulically actuated grab fingers for a refuse bin. US
10 Patent No. 3762586 discloses articulated arms on a front loading refuse vehicle.

US Patent No. 4401407 discloses a grasping arm on a refuse collection vehicle with an inner arm pivotally mounted on a frame with an outer arm pivoted between its ends to the inner arm. The outer arm is hydraulically moved graspingly in response to movement of the inner arm by a linkage mechanism.
15 The grasping arm is adapted for grasping containers of varying shapes and sizes.

Australian Patent Application 634439 discloses gripping apparatus for a refuse bin including pivotal arm means and a flexible element for gripping a refuse bin.

20 Australian Patent No. 521074 discloses hydraulically actuated fixed arms pivoted at a shoulder pivot.

US Patent No. 3172693 discloses a barrel grab assembly suitable for a fork lift truck.

Australian lapsed Application No. 75458/81 discloses a side loader with
25 grasping arms pivoted at a shoulder joint.

US Patent No. 4227850 discloses a paper roll handling clamp for lift trucks with pivoting clamp arms.

US Patent No. 4461608 discloses a handling apparatus for a rear-loading refuse truck with a pair of pivotal clamping arms.

30 Australian Application No. 82407/82 discloses pivotal grab arms for a container pick-up vehicle.

US Patent No. 4281956 discloses a front-loading grabber apparatus with

pivoting arms.

US Patent No. 3165348 discloses an articulated grabbing arm mechanism with padding thereon for grasping logs, barrels and pipes, etc.

None of the prior art known to the Applicant appears to address the
5 problem of engaging closely-spaced bins and achieving full retraction of the grabbing arms in an out-of-the-way position. Furthermore, the present invention sets out to minimise mechanical damage to the refuse bin in a clamping operation.

Problems have been encountered with known grabber systems causing
10 damage to the bins which are usually made from plastic material; achieving quick cyclic operation in a loading and releasing operation and requiring minimum clearance between bins lined up in rows to allow entry of the grabbing apparatus during normal operation of the vehicle between loading cycles.

Optimum positioning of the grabbing apparatus relative to the vehicle
15 chassis will assist in reduction of load/unloading cycle time for each refuse bin.

There is provided according to the present invention a remote control refuse bin grabbing apparatus for grabbing a bin for movement to an elevated unloading position, including a power driven linkage mounted for moving a bin engaging means towards inter-engagement with the bin, said bin engaging
20 means including a retractable grabber means including clamping arm means for engaging and firmly grabbing a bin, wherein the grabber means includes a pair of articulated grabber arms adapted to move into embrace with the bin in a grabbing and lifting apparatus, the grabber arms being retractable into an out of the way rest position not protruding from the confines of the vehicle in said
25 position. Thus the vehicle can be legally driven with the grabber arms in said out of the way rest position but well positioned to commence its next loading cycle.

There is provided according to a further aspect of the invention a refuse bin grabbing apparatus for grabbing a bin for movement to an elevated
30 unloading position including a power driven linkage mounted for moving a bin engaging means towards inter-engagement with the bin, bin engaging means including a retractable grabber means including articulated clamping arm

means for embracing a bin said arms being fitted with flexible belt means located between the clamping arms and a bin to be clamped the arrangement being such that the belt is tensioned to substantially fully engage and clamp the refuse bin when said clamping arm means are moved to embrace a refuse bin.

- 5 The arrangement is such that the flexible belt means contacts the bin over a relatively large surface area with few, if any, high pressure forces being directly applied to the bin by the articulated clamping arm means.

 The grabber arms are configured and constructed to move in such a way to require minimal lateral spacing relative to the side of the bin so that closely
10 spaced bins, or bins closely spaced to some fixed object, can be accessed and grasped for emptying.

 In a specific aspect of the invention there is provided a remote control refuse bin grabbing apparatus including a pair of grabber arms having connected thereto a flexible belt means extending along the length of the
15 grabber arms and adapted to contact and grip a refuse bin, the grabber arms including an elbow joint between the ends of the arms to allow retraction of the arms and belt means to an out-of-the-way position.

 Conveniently the belt means is supported by securement to the grabber arms at each end thereof and preferably at an intermediate point along the
20 length of the grabber arms.

 In a further aspect of the invention the belt may be secured at a central stationary location on the grabbing apparatus or alternatively is formed in two separate parts and secured to pivot points forming a shoulder joint for each of the grabber arms.

- 25 It has been found that this latter construction provides a more positive support for the belt means in reducing a tendency for the belt to sag when in an untensioned position.

 The grabber mechanism described is inter-changeable with different types of lifting heads, for example a vacuum operated head of the same general
30 type as is disclosed in Australian published specification No. 65312/90 and also German specification No. 2558466, European specifications Nos. 287433 and 327948.

The invention will be described in greater detail with reference to the accompanying drawings in which:

Figure 1 shows a plan view of a grabber mechanism in a ready to load position.

5 Figure 2 is a plan view of the same grabber mechanism in a folded or retracted position;

Figure 3 is a plan view of the grabber mechanism moving towards a clamping position;

10 Figure 4 is a plan view of the grabber mechanism in a fully clamped position;

Figure 5 is a perspective view from above showing the grabber mechanism in more detail.

Figure 6 is a plan view of the further embodiment of the grabber mechanism in folded or retracted position showing a modified belt attachment.

15 With reference to the drawings, the grabber mechanism includes a pair of shoulder arm members 2 connected through an elbow joint 10 to arm members 3. The shoulder arm members 2 are controlled by a pair of power cylinders 8 mounted on the housing-ram box 1 to control pivotal movement of the shoulder arm members 2 about shoulder pivot 2a which in turn move the arm members 3
20 to a loading position. The power cylinders 8 are in turn controlled by a valve 7 and can conveniently be actuated by remote control by the driver of the refuse vehicle to which the equipment is attached.

The links 5 are adapted to control the pivotal movement of the shoulder arm members 2 to promote a linear movement of the arm members 3 to reduce
25 to a minimum the lateral movement of the arm members about elbow pivot point 10. In other words the projecting and retracting movement of the arm members 3 is more or less directed linearly outwardly of the grabber mechanism. This feature coupled with the relatively narrow dimension of the grabber arms allows entry between narrowly spaced refuse bins, or bins positioned close to an
30 immovable object such as a power pole or the like.

The arm members 3 have mounted thereon a gripping belt 6 connected at the ends of the arms and also on a support mount 4 on the grabber

mechanism to extend with the arm members to embrace a refuse bin as shown in Figure 4 in the fully clamped position.

A small tension spring 10a is optionally provided, secured between the shoulder arm member 2 and the belt 6 to restrain slack movement of the belt 5 during movement from a retracted position to a bin engaging position. The belt 6 is drawn into surface-to-surface contact with a refuse bin and contacts the bin over a relatively large surface area to reduce or avoid localised large high pressure forces being directly applied by the arm members 2 and 3 to the bin surface.

10 The grabbing mechanism as is best shown in Figure 5 is fully adjustable to accommodate various width bins from 80 to 300 litre square style bins and 135 to 300 litre round style bins. The grabber mechanism can be fitted to the left hand or right hand side of the truck. The flexibility of the arm member 3 in combination with the belt support allows the belt to unfold and wrap around a 15 bin of varying configurations and varying positions and yet it is unlikely to cause any material damage to the construction of the bin whilst taking a firm grip on the bin during an unloading operation. The fully closed position illustrated in Figure 4 represents the maximum closing movement of the grabbing mechanism and will vary according to the size of the bin being grasped.

20 Preferably the belt is a multi-backed belt with a fingerprint style rubber on the face contacting the bin. The belt is of a non-stretch design and is therefore drawn tight around a bin during operation of the power cylinders and flexible arms supporting the belt. With reference to Figure 2, this shows the grabbing mechanism in a fully folded position with the arm members 2 and 3 fully 25 retracted and barely protruding from the mounting structure 1.

The arrangement shown in Figures 3 and 4 show the movement of the clamping arms from the fully retracted position to a clamping position in which the arms move outwardly in a more or less linear fashion from the support housing.

30 Figure 5 shows in greater detail the support for the grabbing mechanism showing the manner of pivoting of the grabber mechanism from a street level position to the tipping position.

The tipping linkage may be in accordance with our earlier Australian application No. 60231/90 entitled "A Side Life Rubbish Bin Lifter", showing the lifting linkage in greater detail, particularly relative to the grabbing mechanism. A similar lifting mechanism may be used as is described in the above referenced

5 Australian specification in connection with the current grabbing mechanism.

The major components of the lifting mechanism include a rotary actuator **11, 11A**. In this regard one of the rotary actuators **11A** may be dispensed with light weight lifts of no more than 75 kg. These actuators **11, 11A** are mounted on a base support plate **12** connected to a transverse slide **13**, that is movable

10 transversely of the truck for up to a distance of 1.8 meters. Thus, the grabbing mechanism may be moved in and out towards a bin to be engaged for a total distance of 1.8 meters.

The main grabber arrangement attaches to the drive member **14** which includes levelling struts **15** and **15A** to control the lifting motion of the grabber

15 mechanism in a specific pattern of arcuate movement.

The grab assembly is therefore controlled from moving through its at rest position to an angle of almost 150° when the tipping of the bin occurs at the top of its travel. During initial lifting movement from the park position through 90° the arm members **3** remain approximately parallel to the ground so that the bin

20 remains almost vertical until movement through 150° whence the grab assembly commences a tipping arc from 150° to 180° of its travel. As previously mentioned this is described in greater detail in our earlier Australian application No. 60231/90.

With reference to Figure 6 the belt **6** is formed in two parts as shown and

25 secured at each end. The inner ends **17** of the belt are secured to blocks **18** connected directly to the shoulder pivots **2a**. This has the desirable effect of limiting the belt span between the connecting points and thereby reducing the likelihood of belt sag in its untensioned condition.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

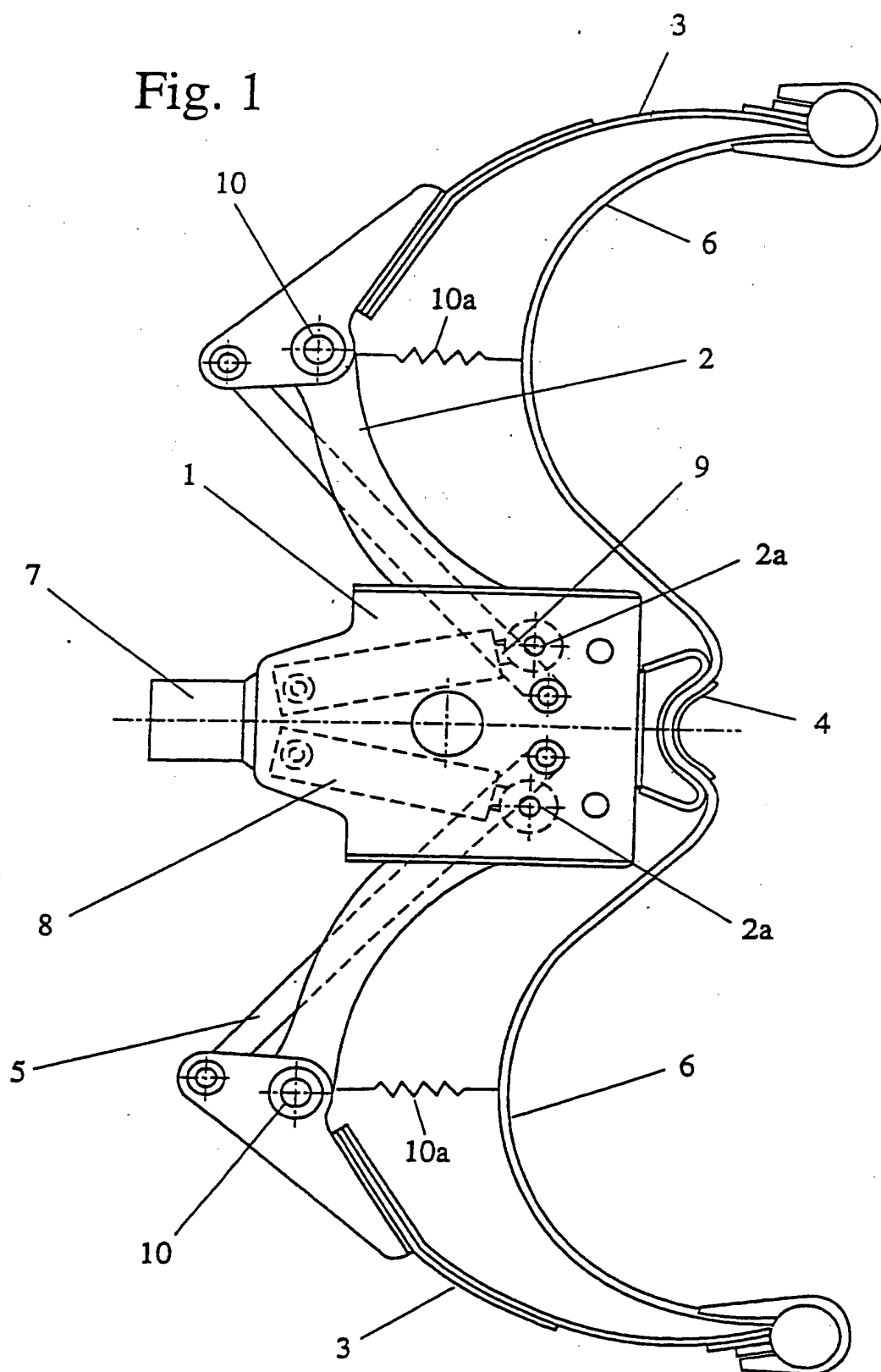
1. A remote control refuse bin grabbing apparatus for grabbing a bin for movement to an elevated unloading position including a power driven linkage mounted for moving a bin engaging means towards inter-engagement with the bin, the bin engaging means including a retractable grabber means having articulated clamping arm means for embracing a bin said arms being fitted with a flexible belt means located between the clamping arms and a bin to be clamped, the arrangement being such that the belt is tensioned to substantially fully engage and clamp the refuse bin when said clamping arm means are moved to embrace a refuse bin.
2. Apparatus as claimed in claim 1 wherein the flexible belt means contacts the bin over a relatively large surface area with few if any high pressure forces being directly applied to the bin by the articulated clamping means.
3. A remote control refuse bin grabbing apparatus including a power driven linkage connected to a pair of grabber arms having connected thereto a flexible belt means extending along the length of the grabber arms and adapted to contact and grip a refuse bin, the grabber arms including an elbow joint between the ends of the arms and a shoulder pivot point at the inner end of the arms to allow retraction of the arms and belt means to an out-of-the-way position.
4. Apparatus as claimed in claim 3 wherein the belt means is supported by securement to the grabber arms at each end thereof.
5. Apparatus as claimed in claim 4 wherein the belt is secured at a central stationary location on the grabbing apparatus, is formed in two separate parts and secured to pivot points forming a shoulder joint for each of the grabber arms.
6. Apparatus as claimed in claim 1 wherein the grabber means includes a

pair of articulated grabber arms adapted to move into embrace with the bin in a grabbing and lifting operation, the grabber arms being retractable into an out-of-the-way rest position not protruding from the confines of the vehicle in said position.

7. Apparatus as claimed in claim 6 wherein the grabber arms are configured and constructed to move in such a way as to require minimal lateral spacing relative to the side of a bin to be contacted so that closely spaced bins or bins closely spaced to some fixed object can be accessed and grasped for emptying.

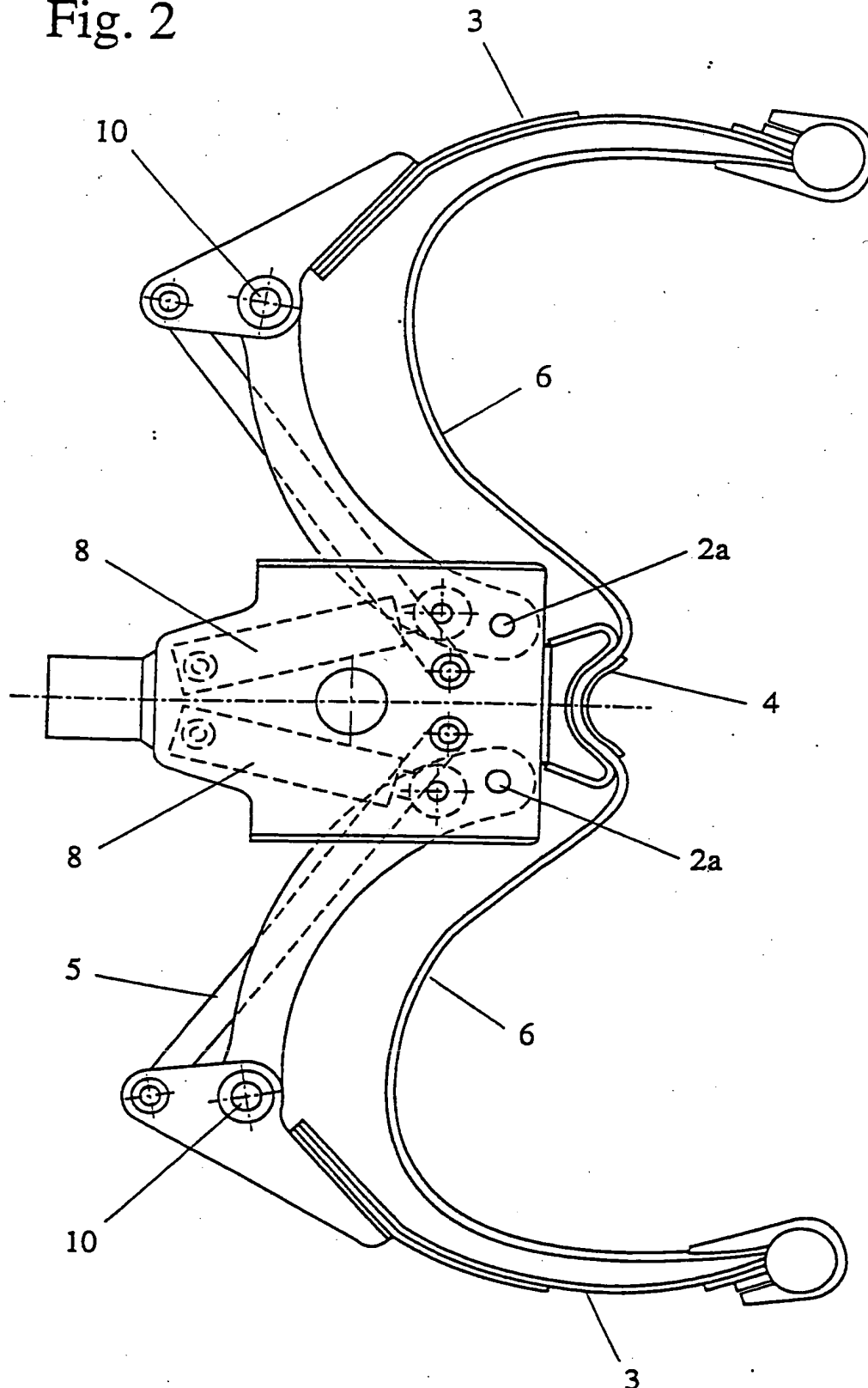
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Fig. 1



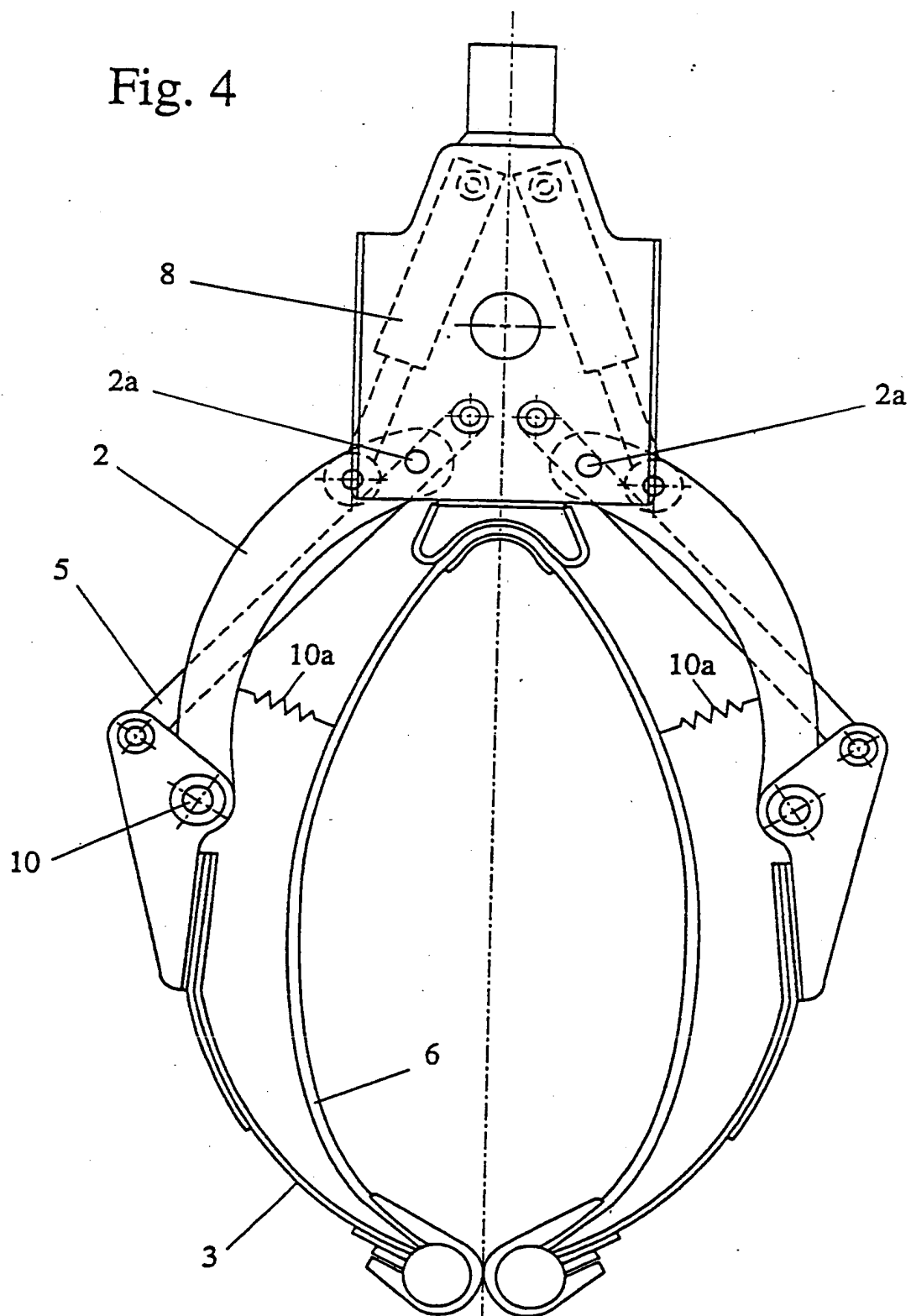
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Fig. 2



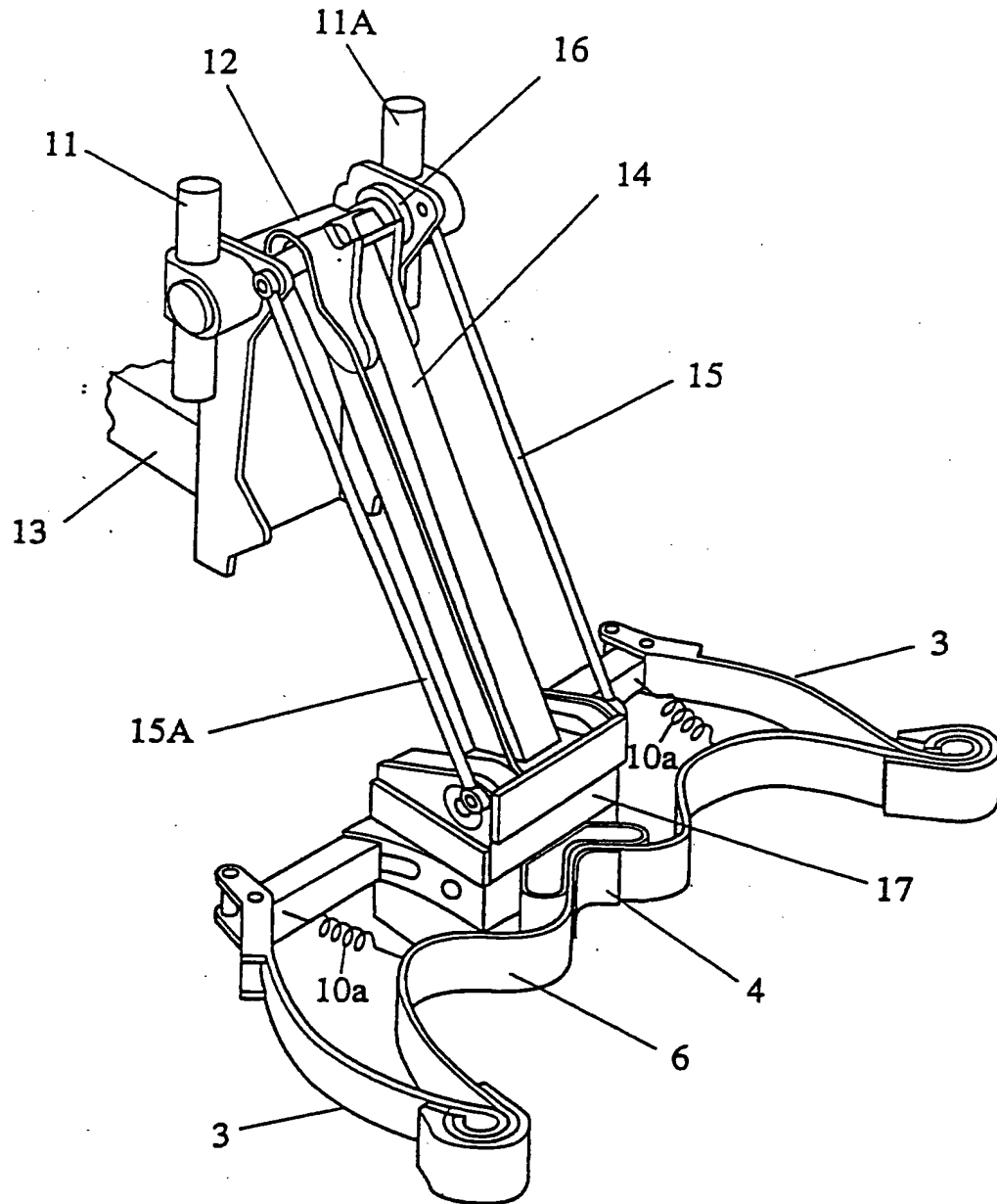
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Fig. 4



5/6

Fig. 5



A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ B65F 3/04; B66C 3/04, 1/44 According to International Patent Classification (IPC) or to both national classification and IPC.				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC ⁵ : B65F 3/04 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : B65F 3/04; B66C 3/04, 1/44 Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
X	AU,A, 60231/90 (MACDONALD JOHNSTON ENGINEERING) 14 February 1991 (14.02.91) See figure 6, page 5 lines 25-35	1,3		
P,X	AU,B, 20516/92 (634439) (AHRENS) 18 February 1993 (18.02.93)	1,3		
A	US,A, 4461608 (BODA) 24 July 1984 (24.07.84)	1,3		
A	GB,A, 998405 (DENNIS BROTHERS LIMITED) 14 July 1965 (14.07.65)	1,3		
A	FR,A, 2632938 (SITA) 22 December 1989 (22.12.89) (and Derwent Abstract, PAN 90-046680, SAN N90-035780)	1,3		
<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <input type="checkbox"/> Further documents are listed in the continuation of Box C. </div> <div> <input checked="" type="checkbox"/> See patent family annex. </div> </div>				
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Date of the actual completion of the international search 2 August 1993 (02.08.93)		Date of mailing of the international search report 9 AUG 1993 (9.08.93)		
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer David Lee <i>DL</i> Telephone No. (06) 2832107		

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